

European bison research at Warsaw University of Life Sciences (SGGW): 70 years of biology and conservation

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Abstract: The European bison (*Bison bonasus*), the largest terrestrial mammal in Europe, has become a well-known example of successful species restoration through captive breeding and conservation efforts. The rapid development of conservation programs created a need for comprehensive biological knowledge of the species. Consequently, from the 1950s onward, intensive multidisciplinary studies on the European bison were initiated in Poland, involving researchers from the Warsaw University of Life Sciences (SGGW), the Polish Academy of Sciences, and other research centers.

The rapid development of conservation programs created a need for comprehensive biological knowledge of the species. Consequently, from the 1950s onward, intensive multidisciplinary studies on the European bison were initiated in Poland, involving researchers from the Warsaw University of Life Sciences (SGGW), the Polish Academy of Sciences, and other research centers. These studies focused on anatomy, morphology, physiology, reproduction, pathology, genetics, and wildlife management, and laid the foundations of modern European bison biology. A substantial portion of this research was published in the Bisoniana series in Acta Theriologica, one of the most important coordinated scientific programs devoted to a single large mammal species in post-war Europe.

Research conducted at SGGW, often in collaboration with scientific organizations, national parks, breeding centers, and the State Forests, including the European Bison Friends Society, has substantially contributed to both the scientific understanding and practical protection of the European bison. Scientific research conducted at the Warsaw University of Life Sciences (SGGW) has resulted in more than 360 institution-affiliated papers concerning the European bison. This review presents the most important of these publications and summarizes the major research areas developed by SGGW researchers over the years.

The reviewed publications cover a wide range of topics, including conservation biology, veterinary medicine, genetics, ecology, population management, and human–wildlife interactions. Together, they illustrate the significant contribution of SGGW researchers to the biological understanding and conservation of the European bison over the last seven decades.

Keywords: SGGW, research, wisdom, monitoring

Introduction

The European bison (*Bison bonasus*), the largest terrestrial mammal in Europe, has become a well-known example of successful species restoration through captive breeding and conservation efforts. After its extinction in the wild in the early twentieth century, the species survived only in captivity, and all contemporary populations originate from a very limited number of founders (Słatis 1960; Olech 2009). Restoration efforts initiated in Poland in the 1920s, particularly in the Białowieża Forest, led to the successful re-establishment of free-ranging populations and established Poland as the principal center for European bison conservation and breeding (Krysiak 1967). The rapid development of conservation programs created a need for comprehensive biological knowledge of the species. Consequently, from the 1950s onward, intensive multidisciplinary studies on the European bison were initiated in Poland, involving researchers from the Warsaw University of Life Sciences (SGGW), the Polish Academy of Sciences, and other research centers. These studies focused on anatomy, morphology, physiology, reproduction, pathology, genetics, and wildlife management, and laid the foundations of modern European bison biology (Krysiak & Świeżyński 1967).

Particularly important were the extensive anatomical and morphofunctional investigations conducted on osteological collections of known age, sex, and pedigree. Research carried out by Krysiak, Roskosz, Świeżyński, Kobryń, Węgrzyn, and other authors provided detailed descriptions of the skeletal, muscular, cardiovascular, digestive, and reproductive systems of the species (Empel & Roskosz 1963; Świeżyński 1968; Węgrzyn 1968; Kobryń 1973; Olbrych *et al.* 2016). These studies not only expanded comparative anatomical knowledge of large ruminants but also contributed to the development of veterinary care, immobilization protocols, and breeding management, and understanding of biomechanical adaptations associated with the large body size of the European bison (Piwowarczyk 1967; Pilarski *et al.* 1967).

At the same time, physiological and cytogenetic studies provided important insights into digestive adaptations, stress responses, reproductive biology, and the genetic consequences of the severe population bottleneck experienced

by the species (Gill 1967; Fedyk & Sysa 1971). The integration of fundamental biological research with practical conservation activities became one of the distinguishing features of Polish European bison studies and contributed substantially to the long-term success of species restitution programs.

In later decades, increasing attention was devoted to veterinary medicine and diseases affecting European bison populations. Research focused on the epidemiology and health consequences of infectious and parasitic diseases, including tuberculosis and ashworthiosis caused by the invasive nematode *Ashworthius sidemi* (Anusz *et al.* 2017; Demiaszkiewicz & Pyziel 2010; Radwan *et al.* 2010). These studies highlighted the importance of disease surveillance and health monitoring in both captive and free-ranging populations, emphasizing infectious diseases and parasite transmission as major challenges for the long-term conservation and management of the species.

Polish scientific and educational institutions, including the Warsaw University of Life Sciences, also play a significant role in promoting the European bison as a symbol of national natural heritage and wildlife conservation. Through research, education, publications, and public outreach, SGGW helps increase awareness of the cultural and environmental importance of the European bison in Poland (Klich & Olech 2024; Szttych 2014).

Development of European bison research in Poland

The restoration of the European bison population in Poland after World War I created a strong need for scientific studies focused on the biology, health, and management of the species. As the global center of European bison restitution, Poland assumed a leading position in research on this species (Krysiak 1967). From the 1950s onward, researchers associated with the Warsaw University of Life Sciences (SGGW) played an important role in the development of European bison studies in Poland (Krysiak & Świeżyński 1967).

Early studies primarily focused on descriptive and comparative anatomy. The availability of unique osteological material from animals of known age, sex, and pedigree enabled detailed investigations of the skeletal, muscular, and internal organ systems of the European bison (Empel & Roskosz, 1963; Roskosz, 1973; Świeżyński, 1962). These studies provided the foundation for understanding the functional morphology, biomechanics, and developmental biology of the species. Research conducted during this period included analyses of the skull, vertebral column, thorax, limbs, cardiovascular system, and digestive tract, as well as investigations of growth-related and pathological skeletal changes (e.g., Kobryń 1973; Węgrzyn 1968; Pytel 1969; Kobryń & Kobryńczuk 1973; Szara *et al.* 2023; Gündemir & Szara 2025).

In subsequent decades, research gradually expanded to physiology, reproduction, cytogenetics, veterinary medicine, and wildlife management. Studies on digestive physiology, stress responses, and reproductive biology provided important information on the adaptation of European bison to captive breeding and free-ranging conditions (Gill 1967; Świeżyński 1968). At the same time, cytogenetic investigations focused on the genetic consequences of the severe population bottleneck and hybridization with domestic cattle (Fedyk & Sysa 1971).

Increasing attention was also devoted to infectious and parasitic diseases affecting European bison populations. Research focused on the epidemiology and health consequences of diseases such as tuberculosis and ashworthiosis caused by the invasive nematode *Ashworthius sidemi* (e.g., Demiaszkiewicz & Pyziel 2010; Radwan *et al.* 2010; Anusz *et al.* 2017). These studies emphasized the importance of health monitoring and disease surveillance in both captive and free-ranging populations and highlighted the growing role of veterinary medicine in European bison conservation.

As a result, European bison research in Poland evolved from predominantly anatomical investigations toward multidisciplinary, conservation-oriented studies integrating biology, veterinary medicine, and population management. The development of these research directions contributed substantially to improving conservation strategies and establishing long-term monitoring and management programs for European bison populations.

Morphological foundations of European bison biology

One of the principal directions of early European bison research conducted at the Warsaw University of Life Sciences (SGGW) focused on the species's skeletal system and functional morphology. The availability of extensive osteological collections from animals of known age, sex, and pedigree enabled detailed anatomical and morphometric analyses of the European bison skeleton and provided valuable insight into its biomechanical adaptations and developmental biology (Krysiak & Świeżyński 1967).

Initial studies concentrated on the morphology of the skull, vertebral column, and thorax. Roskosz and Empel (1961) described characteristic skeletal features associated with the large body size and massive forequarters of the European bison, including strongly developed thoracic vertebrae and elongated spinous processes forming the characteristic hump of the species (Roskosz & Empel 1961; Roskosz 1973). Comparative analyses demonstrated that these structures were not solely related to head support but also reflected functional adaptations associated with locomotion and feeding behavior

(Roskosz & Empel 1961). Detailed osteometric investigations were also conducted on the limbs and thoracic skeleton. Empel and Roskosz (1963) described the skeletal structure of the forelimbs and hindlimbs, emphasizing developmental and sex-related differences in bone proportions and growth patterns. Subsequent studies by Kobryń (1973) demonstrated that the thorax of the European bison is characterized by considerable depth and width, reflecting adaptations that support intensive muscular activity and the species's large body mass. Research on postembryonic growth of limb bones further showed that skeletal development was closely associated with increasing biomechanical loads during ontogeny (Kobryńczuk & Kobryń 1973).

Functional morphology studies also included analyses of the vertebral canal, ligaments, and muscular attachments associated with the axial skeleton (Roskosz 1973). These investigations contributed to the understanding of the biomechanics of posture and locomotion in large wild ruminants and provided important comparative data for studies on Bovidae evolution and anatomy. In addition to studies of normal skeletal morphology, several investigations addressed pathological and developmental abnormalities observed in European bison. Pilarski (1956) and Kobryń and Kobryńczuk (1973) described skeletal deformities and pseudoarthrosis, emphasizing the possible relationship between developmental disorders, stress, and the reduced genetic diversity of the restored population. Together, these studies established the foundations of European bison osteology and functional anatomy, while also providing practical information relevant to veterinary medicine, conservation breeding, and the management of captive and free-ranging populations.

Beyond skeletal morphology, SGGW researchers also investigated the European bison's muscular system and locomotor adaptations. Świeżyński (1962) described the skeletal-muscular system of the species, emphasizing the strong development of the neck, shoulder, and thoracic musculature associated with the massive forequarters and characteristic hump. These adaptations were considered important for supporting the heavy head and anterior body region, as well as for movement in forest environments. Studies on the limbs and thoracic skeleton demonstrated that the muscular apparatus of the forelimbs is more strongly developed than that of the hindlimbs, reflecting the anterior distribution of body mass typical of the species (Empel & Roskosz 1963; Kobryń 1973). Research on postnatal skeletal development also showed that locomotor adaptations develop progressively with increasing body mass and biomechanical loading during ontogeny (Kobryńczuk & Kobryń 1973). Functional analyses also highlighted the importance of elongated thoracic spinous processes and associated muscular and ligamentous attachments in stabilizing the head and neck during locomotion and feeding behavior

(Roskosz & Empel 1961). Together, these studies contributed substantially to understanding the biomechanics and functional anatomy of the European bison.

Another important direction of research concerned the morphology of internal organs and reproductive anatomy. Detailed anatomical investigations focused primarily on the cardiovascular, digestive, and reproductive systems, providing important information on the functional biology of the species. Particular attention was devoted to the digestive tract and its adaptations to herbivorous feeding. Studies by Gill (1968) and Pytel (1969) described the morphology, capacity, and proportions of the stomach and intestines, emphasizing the importance of the extensive forestomach system for the digestion of fibrous plant material. Earlier investigations on rumen ciliates and digestive physiology further contributed to understanding fermentative processes in the alimentary tract of the European bison (Gill, 1954; Gill, 1967). Important studies also examined the cardiovascular system. Węgrzyn (1968) provided a detailed description of heart morphology and morphometric parameters, demonstrating adaptations associated with the large body size and considerable physical demands of the species. Considerable attention was additionally devoted to reproductive anatomy. Świeżyński (1968) conducted comprehensive investigations of the male reproductive organs, describing developmental changes and anatomical features associated with reproductive biology in the European bison.

In subsequent years, detailed morphometric analyses of the European bison skull revealed distinct morphological patterns associated with sex, age, and population variability, contributing to a better understanding of cranial anatomy and the evolutionary adaptations of the species (Szara *et al.* 2023; Gündemir & Szara 2025). Another study presented a morphometric analysis of seminiferous tubules in the testes of 2- and 3-year-old European bison males, demonstrating that individuals with active spermiogenesis possessed larger seminiferous tubule diameters and a more developed spermatogenic epithelium, which may be important for assessing sexual maturity and fertility in European bison (Czykier *et al.* 2012). SGGW researchers also investigated uterine morphology, hair coat characteristics, and the anatomy of orbital glands, including the Harderian gland, lacrimal gland, and superficial gland of the third eyelid, thereby expanding knowledge of reproductive biology, thermoregulation, and ocular physiology in the species (Klećkowska-Nawrot *et al.* 2015).

Another significant area of research concerned comparative and clinical anatomy. Detailed analyses of the adrenal glands described the morphology and histological organization of these endocrine organs, providing baseline

reference data for future pathological and physiological studies (Barszcz *et al.* 2016). SGGW scientists have also applied advanced *postmortem* imaging methods in wildlife diagnostics. A case report describing a double-inlet left ventricle in a 12-year-old European bison combined anatomical dissection with postmortem computed tomography, demonstrating the usefulness of modern diagnostic imaging in identifying congenital cardiovascular abnormalities in this endangered species (Godlewska *et al.* 2025). Together, these studies substantially expanded knowledge of the internal anatomy and physiology of the European bison and provided an important basis for comparative anatomy, veterinary medicine, and conservation management.

Physiology, nutrition and adaptation

Digestive physiology and rumen microbiology

Studies on digestive physiology and nutrition formed an important component of European bison research conducted at the Warsaw University of Life Sciences (SGGW). Investigations focused on the structure and function of the digestive tract, rumen microbiology, and physiological adaptations associated with herbivorous feeding and the digestion of fibrous plant material.

Particular attention was devoted to the morphology and capacity of the alimentary tract. Gill (1968) and Pytel (1969) described the size, weight, and proportions of the stomach and intestines, demonstrating that the extensive forestomach system plays a crucial role in the digestion and utilization of low-quality plant biomass. These studies also provided valuable comparative data for understanding digestive adaptations in large wild ruminants.

An important line of research concerned rumen microbiology and fermentative processes. Early investigations by Gill (1954) analyzed the composition of rumen ciliates in the European bison and demonstrated the importance of microbial communities for digestion and nutrient utilization. Subsequent physiological studies focused on fermentation processes and digestive efficiency under captive conditions, contributing to a better understanding of nutritional requirements and feeding adaptations in the species (Gill 1967).

Together, these investigations significantly expanded knowledge of digestive physiology in the European bison and provided practical information relevant to feeding management, captive breeding, and conservation of free-ranging populations.

Nutritional adaptations

Research on nutrition and feeding adaptations in the European bison focused primarily on physiological mechanisms that enable the utilization of highly fibrous plant material and adaptation to changing environmental conditions. Studies conducted during the restitution period emphasized the importance of appropriate feeding management in captive breeding and reintroduction programs.

Investigations of digestive efficiency and alimentary tract morphology demonstrated that the European bison is well adapted to the digestion of coarse plant biomass typical of forest habitats (Gill 1967; Pytel 1969). These studies provided important information for the development of feeding strategies in captive populations and contributed to improving management practices during the restoration of the species.

Reproductive anatomy and postnatal development

Research on reproduction and postnatal development in the European bison has focused primarily on anatomical and morphological changes associated with maturation and growth. One of the most comprehensive studies in this field was conducted by Świeżyński (1968), who provided a detailed description of the male reproductive organs of the species, including developmental changes related to age and sexual maturation.

Investigations of skeletal growth and ontogeny further demonstrated that postnatal development in the European bison is closely associated with increasing biomechanical demands and progressive changes in body proportions. Studies by Kobryńczuk and Kobryń (1973) showed that the growth of limb bones reflects functional adaptation to increasing body mass during ontogeny.

Together, these studies have advanced understanding of reproductive anatomy, growth, and developmental processes in the European bison and provided practical information relevant to breeding management and conservation programs.

Pathology, abnormalities and veterinary advances

Alongside studies on normal anatomy and physiology, research conducted at the Warsaw University of Life Sciences (SGGW) also addressed pathological changes, developmental abnormalities, and veterinary management of the European bison. These investigations became increasingly important

during the restitution process, when the restored population was affected by limited genetic diversity, captivity-related stress, and emerging health problems. Studies performed over subsequent decades substantially contributed to improving veterinary care, disease monitoring, and conservation management of both captive and free-ranging populations.

Skeletal abnormalities and developmental disorders

Pathological and developmental changes in the skeletal system constituted one of the early directions of veterinary and anatomical research on the European bison. Investigations focused mainly on bone deformities, vertebral abnormalities, and pathological changes associated with growth and biomechanical stress. Pilarski (1956) described skeletal deformities observed in European bison specimens, providing one of the earliest reports on developmental abnormalities in the restored population. Subsequent studies by Kobryń and Kobryńczuk (1973) analyzed cases of pseudoarthrosis and emphasized the possible relationship between skeletal disorders, intensive mechanical loading, and the reduced genetic diversity characteristic of the species following the population bottleneck. Research on the vertebral column and thoracic skeleton additionally demonstrated that the massive forequarters and strongly developed thoracic region of the European bison may predispose animals to certain locomotor and skeletal disorders (Roskosz 1973; Kobryń 1973). These investigations contributed to understanding pathological processes affecting the musculoskeletal system and provided important information for veterinary diagnostics and captive breeding management.

Veterinary procedures and immobilisation

The development of veterinary procedures became an important aspect of European bison conservation and management, particularly during the period of captive breeding and animal translocation. Early studies focused mainly on immobilisation techniques and handling procedures necessary for veterinary treatment and transportation. Piwowarczyk (1967) described early attempts at pharmacological immobilisation of European bison using chloral hydrate and ethyl alcohol, emphasizing the physiological responses and practical difficulties associated with sedation in large wild ruminants. These investigations provided an important basis for the later development of safer immobilisation protocols and veterinary management procedures. Additional studies concerned anatomical preparation techniques and preservation of biological material. Pilarski *et al.* (1967) described methods for fixing anatomical

specimens of large mammals, contributing to the development of research collections and comparative anatomical studies on the European bison.

Researchers from the Warsaw University of Life Sciences have also played an important role in the development of reproductive biotechnology and assisted reproduction methods for the conservation of the European bison. Their studies focused on improving reproductive efficiency and preserving the genetic diversity of this endangered species through advanced in vitro techniques and gamete cryopreservation (Ziętek *et al.* 2025). One of the key achievements was the successful production of early-stage European bison blastocysts under in vitro conditions. This study demonstrated the feasibility of applying assisted reproductive technologies in wisent conservation and highlighted their potential importance for biodiversity preservation, genetic resource banking, and future breeding programs aimed at supporting vulnerable populations (Duszeńska *et al.* 2018). SGGW scientists have also contributed to the optimization of sperm cryopreservation techniques. Research on epididymal spermatozoa showed that the use of Percoll® density gradient centrifugation before freezing significantly improved sperm quality after thawing. These findings are particularly important for the establishment of genetic banks and long-term conservation strategies, as they increase the effectiveness of preserving valuable genetic material from European bison males (Eberhardt *et al.* 2022).

Infectious and invasive diseases

In later decades, growing interest focused on infectious and parasitic diseases affecting European bison populations. Research concentrated on disease epidemiology, pathogen transmission, and the health consequences of infections in both captive and free-ranging herds.

Considerable attention was devoted to bovine tuberculosis. Studies conducted by veterinary teams associated with SGGW emphasized the epidemiological importance of disease surveillance, particularly in the context of increasing population density, animal translocations, and expanding free-ranging herds (Anusz *et al.* 2017; Krzysiak *et al.* 2016; 2022). These investigations identified tuberculosis as one of the major long-term infectious threats to European bison conservation and highlighted the necessity of integrating veterinary monitoring with wildlife management strategies.

Substantial attention was also directed to chronic diseases affecting the reproductive system of male European bison. Studies conducted in the Białowieża population described severe balanoposthitis and necrotic inflammatory lesions of the prepuce and penis, which were associated with tissue deformation,

impaired urination, and deterioration of body condition (Piusiński *et al.* 1997). Subsequent investigations analyzed biochemical parameters in affected individuals and suggested possible relationships between the occurrence of balanoposthitis, immune status, environmental factors, and the limited genetic diversity of the species (Dębska *et al.* 2005). Earlier studies conducted in the Białowieśka Forest indicated that balanoposthitis was associated with opportunistic bacterial infections rather than a single specific pathogen. Bacteriological examinations identified diverse bacterial taxa in lesions, while experimental studies did not confirm the involvement of bovine herpesvirus type 1 (BHV-1) as the primary causative agent. These investigations also included some of the first attempts at therapeutic management of affected animals and contributed substantially to understanding the etiology of the disease (Kita *et al.* 1990; 2003).

Veterinary investigations additionally addressed general health monitoring and infectious diseases affecting free-ranging herds. Anusz *et al.* (2017) underscored the growing importance of disease surveillance and veterinary management in conservation programs, particularly in the context of increasing population size, translocations, and contact with domestic livestock. A broader synthesis of health, demographic, and ecological data collected over several decades indicated that disease occurrence in European bison populations is closely linked to population density, management practices, and environmental conditions. These studies emphasized the importance of integrating veterinary surveillance with conservation management to ensure the long-term viability of free-ranging herds (Kita *et al.* 2003; Larska *et al.* 2023).

In subsequent years, long-term health protection of European bison populations was increasingly strengthened through extensive serological, parasitological, and microbiological monitoring programs conducted in both captive and free-living herds. Establishing reference ranges for biochemical and hematological parameters was crucial for effective health monitoring and clinical assessment of both European bison populations and individual animals (Anusz *et al.* 2007; Didkowska *et al.* 2024a). Additional studies investigated clinicopathological indicators of organ dysfunction, including renal pathology and associated biochemical parameters, providing valuable reference information for ante-mortem assessment of health status in European bison (Osińska *et al.* 2009).

Serological monitoring is routinely used in European bison health assessment to evaluate exposure to infectious agents, including pathogens associated with respiratory, reproductive, and vector-borne diseases, as well as tuberculosis and paratuberculosis (Didkowska *et al.* 2021a; 2021c; 2023; 2024b; 2025a). Researchers from the Warsaw University of Life Sciences (SGGW) reported the first detections of several pathogens or antibodies

against them in European bison populations, including *Leishmania infantum*, SARS-CoV-2, and influenza A (H1N1), highlighting the growing importance of infectious disease surveillance in this endangered species (Didkowska *et al.* 2025b; 2025c; 2026). Long-term serological surveys conducted in both free-ranging and captive herds demonstrated exposure of European bison to a range of bacterial and viral pathogens commonly associated with livestock. Most infections appeared to be subclinical, highlighting the epidemiological connections between European bison and domestic animals and emphasizing the importance of continuous disease surveillance at the wildlife–livestock interface (Kita and Anusz 1991; Salwa *et al.* 2007).

Microbiological monitoring focuses on bacterial pathogens affecting European bison health and reproduction. Particular attention has been devoted to *Trueperella pyogenes*, a bacterium associated with abscesses, reproductive disorders, and purulent infections. Molecular studies have demonstrated the occurrence of genetically diverse *T. pyogenes* strains in European bison populations, including strains carrying antimicrobial resistance determinants (Rzewuska *et al.* 2012; 2016; Kwiecień *et al.* 2021; 2022). Monitoring programs have also investigated enzootic balanoposthitis, an infectious disease affecting the reproductive organs of males and representing another important health problem in captive and free-living herds (Bielecki *et al.* 2023).

Studies conducted in major European bison populations in Poland, including Białowieska and the Bieszczady Mountains, have demonstrated the occurrence of numerous parasitic species, including the invasive gastrointestinal nematode *Ashworthius sidemi*, liver flukes *Fasciola hepatica*, eyeworms of the genus *Thelazia* spp., and several vector-borne pathogens, while also evaluating the effectiveness of antiparasitic treatment programs (e.g., Demiaszkiewicz *et al.* 2018; 2020b; Pyziel *et al.* 2020; Karbowski *et al.* 2025; Didkowska *et al.* 2026). Special emphasis has been placed on ashworthiosis, a disease caused by the invasive nematode *Ashworthius sidemi*. Studies by Demiaszkiewicz and Pyziel (2010) demonstrated the widespread occurrence of this parasite in European bison populations, while Radwan *et al.* (2010) investigated the relationship between infection intensity, host density, and genetic diversity. These studies highlighted the importance of parasitic infections as an emerging threat to the conservation and health of European bison populations.

Additional studies conducted by Pyziel and collaborators (2020) focused on lungworms of the genus *Dictyocaulus* in European bison populations. Molecular and parasitological analyses confirmed the occurrence of *Dictyocaulus viviparus* infections in both free-ranging and captive herds, demonstrating that lungworm infections may constitute an important health factor influencing respiratory condition and overall fitness in European bison populations.

Research on gastrointestinal nematodes in captive European bison has demonstrated both the scale of endoparasite infections and the effectiveness of commonly used anthelmintic treatments, indicating that standard deworming protocols may not always provide complete parasite control in captive herds. These findings highlighted the importance of regular parasitological monitoring and evaluation of treatment efficacy in conservation breeding programs (Gałązka *et al.* 2023). Further investigations comparing captive and free-living populations of European bison revealed substantial diversity in abomasal nematode communities. Using both morphometric and molecular methods, researchers identified differences in parasite composition between managed and wild populations, emphasizing the influence of environmental conditions and husbandry practices on parasite transmission dynamics and host health (Gałązka *et al.* 2024).

Currently, two of the most important health problems affecting the European bison population in the Bieszczady Mountains are bovine tuberculosis and infectious keratoconjunctivitis, both of which represent significant challenges for conservation management and veterinary monitoring.

Tuberculosis is one of the most serious infectious threats to contemporary European bison conservation. In European bison, the disease is caused mainly by *Mycobacterium caprae*, which belongs to the *Mycobacterium tuberculosis complex* (MTBC). It has become a major veterinary and management problem, particularly in free-living populations in the Bieszczady Mountains (Bielecki *et al.* 2013; Krajewska *et al.* 2015; Didkowska *et al.* 2021b; Krajewska-Wędzina *et al.* 2023), but also in captive herds (Krajewska *et al.* 2016). Between 1996 and 2013, 45 microbiologically confirmed cases of bovine tuberculosis were recorded in the Bieszczady Mountains (Welz *et al.* 2005; Brewczyński & Welz, 2011; Krajewska *et al.* 2014b). Research on tuberculosis in European bison has included both molecular and serological investigations aimed at identifying *M. caprae* strains and monitoring immune responses in infected animals (Krajewska *et al.* 2013; Didkowska *et al.* 2021c). Veterinary investigations have increasingly focused on the development of effective ante-mortem diagnostic methods. Research has demonstrated the usefulness of tuberculin skin testing and interferon gamma assays (Didkowska *et al.* 2022c). Studies have also introduced innovative diagnostic methods for this species, including biopsies, bronchoscopy, and tracheobronchial aspirates collected from living animals (Didkowska *et al.* 2021b). *Postmortem* examinations have played an important role in tuberculosis diagnostics and epidemiological surveillance. Detailed pathological analyses of infected animals revealed characteristic granulomatous lesions in the respiratory system and lymph nodes (Anusz *et al.* 2017). Additional microbiological and molecular studies, together with

antimicrobial drug assessment, have enabled more precise identification of mycobacterial strains and routes of transmission within populations (Didkowska *et al.* 2022; 2024b). More recently, environmental approaches such as eDNA-based monitoring have been proposed as additional non-invasive tools supporting tuberculosis surveillance in free-ranging populations (Didkowska *et al.* 2025d). Scientists from the Warsaw University of Life Sciences are also working on the development of new biomarkers for tuberculosis diagnostics in European bison. Their studies indicate that acute-phase proteins and selected blood parameters may serve as useful supplementary indicators in ante-mortem tuberculosis diagnosis, improving the early detection of *M. caprae* infection in this vulnerable species and supporting more comprehensive health monitoring strategies (Didkowska *et al.* 2023).

Infectious keratoconjunctivitis has recently emerged as an important health problem in European bison populations in Poland, particularly in the Bieszczady Mountains, where outbreaks of the disease have been repeatedly observed. The disease may lead to conjunctivitis, corneal opacity, and, in severe cases, temporary or permanent blindness. Recent microbiological studies have demonstrated the presence of diverse bacterial communities associated with ocular inflammation, while parasitological and molecular investigations have revealed a high prevalence of *Thelazia* infections in affected populations, suggesting that bacterial pathogens, eyeworm infestations, or a combination of both factors may contribute to disease development (Filip-Hutsch *et al.* 2024; 2025a). Among the detected eyeworms, *T. skrjabini* occurred more frequently and was more commonly associated with severe ocular lesions than *T. gulosa* (Filip-Hutsch *et al.* 2025b).

Researchers from the Warsaw University of Life Sciences have also highlighted the growing importance of co-infections in European bison health monitoring. In particular, they emphasized that simultaneous infections with tuberculosis and parasitic diseases may significantly weaken the immune system, increase susceptibility to secondary pathogens, and complicate both diagnosis and treatment. Their review pointed out that parasite-induced immunomodulation can potentially influence the course and epidemiology of bovine tuberculosis in ungulates, posing an additional threat to vulnerable European bison populations. The authors stressed that comprehensive health surveillance should therefore include both infectious and parasitic agents to better assess disease dynamics and improve conservation strategies (Gałązka *et al.* 2023).

Conservation-oriented studies have additionally emphasized the legal and administrative difficulties associated with eradication programs in protected European bison populations. Researchers have highlighted that disease con-

trol requires balancing veterinary regulations, species protection laws, and ethical considerations related to the management of endangered animals (Bruczyńska *et al.* 2022).

Together, these studies significantly contributed to the development of modern conservation medicine, disease surveillance, and health management strategies for the European bison, particularly in the context of chronic infectious and reproductive disorders affecting free-ranging populations.

Genetics, conservation management and restitution of the European bison

The restoration of the European bison population from only a small number of founders resulted in exceptionally low genetic diversity and stimulated the development of cytogenetic and population genetic studies focused on the biological consequences of this bottleneck. Research conducted at the Warsaw University of Life Sciences (SGGW) addressed chromosome morphology, phylogenetic relationships, founder representation, inbreeding and genetic variability within free-ranging and captive populations.

One of the earliest cytogenetic investigations was conducted by Fedyk and Sysa (1971), who analyzed the chromosomes of European bison, domestic cattle and their hybrids. These studies provided important information on the karyotype of the species and contributed to understanding chromosomal relationships within Bovidae. Comparative cytogenetic analyses performed in later years additionally examined the morphology and structure of Y chromosomes in European bison, American bison and domestic cattle, providing new insight into chromosomal evolution and phylogenetic relationships within the Bovidae family (Kloch *et al.* 2025). Later molecular analyses demonstrated extremely low mitochondrial DNA variability in the restored population, confirming the severe genetic bottleneck experienced by the species during restitution (Burzyńska *et al.* 1999).

A major line of research focused on the consequences of long-term inbreeding. Olech (1987; 2023) demonstrated a high degree of relatedness within the restored population and indicated the potential negative influence of inbreeding on population viability. Further pedigree analyses showed unequal founder representation in contemporary herds and progressive loss of some founder genotypes during the restitution process (Olech 1999).

Studies conducted in later decades investigated genetic variability in free-ranging and captive populations using molecular and immunogenetic approaches. Łopieńska *et al.* (2011) analyzed polymorphism within selected MHC regions in the two genetic lines of European bison, and compared

genetic variability in historical and contemporary populations, demonstrating a continuing reduction of genetic diversity over time. Analyses of free-ranging lowland populations conducted by Grzegorzówka *et al.* (2004) confirmed low genetic diversity in Lowland European bison.

Research also addressed the demographic consequences of low genetic diversity. Olech (2006) demonstrated that inbreeding may influence offspring sex ratio, emphasizing that reduced variability can affect not only genetic structure but also survival, but only in the Lowland-Caucasian line (Olech 2003). The relationship between genetic diversity and disease susceptibility was investigated by Radwan *et al.* (2010), who demonstrated that MHC variability and host density may influence susceptibility to infection by the invasive nematode *Ashworthius sidemi*. In contrast, Matuszewska *et al.* (2004) did not find an influence of inbreeding on diseases of male reproductive organs. Research on the relationship between inbreeding and fitness further showed that the impact of genetic relatedness differs between the two existing genetic lines of European bison, suggesting that management plans should be adapted to the specific genetic background of each population (Olech 2023). Complementary analyses based on STR markers confirmed relatively low genetic diversity in the species and demonstrated the importance of molecular monitoring in breeding programs, translocations and international conservation strategies (Nowak & Olech 2008a; Olech *et al.* 2023; Lapickis *et al.* 2023).

Analysis of DNA using routine methods applied to domestic species showed very low polymorphism, so more detailed analysis of SNPs (single nucleotide polymorphisms) could be a solution. Wojciechowska *et al.* (2012) and Kamiński *et al.* (2012) presented the possibility of using SNPs, and in later research the team used cattle microarrays (Wojciechowska *et al.* 2017) and consequently selected around 50 markers that can be used for genetic identification of individuals as well as genetic line (Wojciechowska *et al.* 2023). As a result of these studies it was possible to identify markers characteristic for both *Bison* species and to validate a genetic test for species recognition developed by Nowak and Olech (2008b).

Knowledge gained from cytogenetic and population genetic studies subsequently became an important foundation for practical conservation management and restitution programs for the European bison. Beginning in the late twentieth century, research conducted at SGGW increasingly expanded toward reintroduction strategies, ex situ conservation, demographic monitoring and the development of coordinated national and international conservation programs.

An important direction of conservation-oriented research concerned the genetic and demographic foundations of reintroduction programs. Olech and

Perzanowski (2002) analyzed the genetic background of European bison reintroductions in the Carpathians and emphasized the importance of founder representation, gene flow and appropriate selection of animals used for population restoration. Olech and Perzanowski (2003) additionally evaluated the possibility of enriching the gene pool of the Stuposiany herd through controlled introduction of individuals from different breeding centers.

Studies conducted in western Poland focused on the establishment and monitoring of new free-ranging populations. Trzeciak *et al.* (2005) described the status of the free-ranging herd in the Zachodniopomorskie region, while Tracz *et al.* (2008) summarized the development of new herds established as part of regional restitution programs. These studies demonstrated the need to create geographically separated populations in order to increase species security and reduce the risks associated with concentrating the majority of animals in only a few locations.

Conservation-oriented investigations also addressed the role of captive breeding and ex situ management in long-term species protection. Olech (2002a) discussed the role of Poland in global restitution programs and management of the European Bison Pedigree Book, while Olech (2010) highlighted the importance of ex situ conservation for maintaining genetic resources and supporting free-ranging populations.

At the international level, coordinated conservation strategies were summarized in the European bison action plan prepared by Pucek *et al.* (2004), which identified the principal threats affecting the species and emphasized the necessity of integrating genetics, veterinary surveillance, habitat protection and active management. Perzanowski and Olech (2007) additionally underlined the importance of the Carpathian ecoregion for the future development of stable European bison metapopulations.

Research conducted during this period also addressed practical aspects of reserve breeding and population management. Dymnicka and Olech (2000) analyzed supplementary feeding practices in breeding centers and demonstrated their influence on animal condition, reproductive performance and herd management. Environmental studies conducted on free-ranging European bison additionally revealed the usefulness of the species as a bioindicator of ecosystem contamination and environmental health (Kośła *et al.* 2011; Skibniewska *et al.* 2006; Klich *et al.* 2021a; 2023b).

Taken together, these studies demonstrate the transition of European bison research at SGGW from predominantly descriptive biological investigations toward interdisciplinary conservation science integrating genetics, ecology, veterinary medicine and practical wildlife management.

Studies on differences between *Bison bonasus*, *Bos taurus* and crossbreds between these species (named żubroń) focused on skin, hair and meat differences among these three groups (Sztych and Olech 2016; Łozicki *et al.* 2017).

Contemporary challenges and future perspectives in European bison conservation

Despite the considerable success of restitution programs, contemporary European bison conservation faces numerous biological, veterinary, and management-related challenges. Research conducted at the Warsaw University of Life Sciences (SGGW) has increasingly addressed issues associated with low genetic diversity, disease transmission, population expansion, and the long-term sustainability of free-ranging herds.

One of the most important challenges remains the exceptionally low genetic variability of the species resulting from the historical population bottleneck. Studies conducted by Olech (1987, 1999, 2003, 2006), Burzyńska *et al.* (1999), Łopieńska *et al.* (2011), Wojciechowska *et al.* (2018; 2023) and Grzegorzółka *et al.* (2004) demonstrated that the restored population is characterized by high relatedness, uneven founder representation, and limited immunogenetic variability. These investigations emphasized the necessity of continuous genetic monitoring and coordinated management of breeding and free-ranging populations to minimize further loss of genetic diversity.

Infectious and parasitic diseases also represent a significant conservation problem in expanding European bison populations. Research conducted by Demiaszkiewicz and Pyziel (2010), Radwan *et al.* (2010), and Anusz *et al.* (2017) demonstrated that increasing population density and contact with domestic livestock may facilitate pathogen transmission and contribute to the spread of parasitic invasions, including infections caused by *Ashworthius sidemi*. These studies highlighted the importance of veterinary surveillance, disease prevention, and health monitoring in both captive and free-ranging herds.

Another important issue concerns the long-term management of expanding free-ranging populations and the need to establish new herds in different regions of Poland and Europe. Studies by Olech and Perzanowski (2002, 2003), Perzanowski and Olech (2007), Trzeciak *et al.* (2005), and Tracz *et al.* (2008) emphasized the importance of metapopulation management, translocations, and the creation of geographically separated populations to improve species security and maintain gene flow between herds.

Conservation-oriented studies additionally highlighted the growing importance of integrating genetics, ecology, veterinary medicine, and habitat management in modern European bison protection programs. Pucek *et al.*

(2004) emphasized that effective conservation of the species requires coordinated international cooperation, active population management, and long-term monitoring of demographic and environmental factors affecting herd stability. One of the most important are reintroductions into nature, which are carefully analyzed by SGGW team (Sobczuk *et al.* 2017; 2023; Suchecka *et al.* 2014). Also Olech (2010) underlined the continuing importance of *ex situ* conservation and scientifically coordinated breeding programs in supporting free-ranging populations.

Research conducted over recent decades demonstrates that European bison conservation has evolved from simple species restitution toward complex interdisciplinary conservation management integrating biological research, veterinary medicine, and ecosystem-level protection. Future conservation success will depend on maintaining genetic diversity, limiting disease transmission, expanding suitable habitats, and ensuring effective cooperation among scientific institutions, breeding centers, and wildlife management authorities.

Contribution of SGGW research to European bison conservation

Research conducted at the Warsaw University of Life Sciences (SGGW) has played a major role in the development of modern European bison conservation and has significantly contributed to the biological understanding, veterinary management, and restitution of the species. Over several decades, studies performed by researchers associated with SGGW evolved from classical anatomical investigations toward interdisciplinary, conservation-oriented research integrating morphology, physiology, genetics, veterinary medicine, and wildlife management.

The earliest contributions from SGGW focused primarily on anatomy and functional morphology. Investigations conducted by Krysiak, Świeżyński, Roskosz, Kobryń, and Węgrzyn established the foundations of modern knowledge of the skeletal, muscular, cardiovascular, and reproductive systems of the European bison (Empel & Roskosz, 1963; Świeżyński, 1962, 1968; Węgrzyn, 1968; Kobryń, 1973). These studies provided valuable comparative data for large ruminant anatomy and created an important scientific basis for veterinary practice, immobilization procedures, and breeding management.

Research on digestive physiology and nutrition further expanded knowledge of the ecological and physiological adaptations of the species. Studies conducted by Gill (1954, 1967, 1968) and Pytel (1969) demonstrated the importance of rumen microbiota and digestive specialization for the utiliza-

tion of fibrous plant material, while later investigations addressed practical aspects of supplementary feeding and management in captive populations (Dymnicka & Olech, 2000).

An important contribution of SGGW research concerned veterinary medicine and health monitoring. Studies on immobilization techniques, skeletal abnormalities, and pathological conditions improved veterinary management of captive and free-ranging populations (Piwowarczyk, 1967; Pilarski, 1956; Kobryń & Kobryńczuk, 1973). In later decades, investigations increasingly focused on infectious and parasitic diseases, particularly infections caused by *Ashworthius sidemi*, emphasizing the growing importance of disease surveillance in conservation programs (Demiaszkiewicz & Pyziel 2010; Radwan *et al.* 2010; Anusz *et al.* 2017).

SGGW researchers also played an important role in the development of conservation genetics and population management of the European bison. Cytogenetic studies conducted by Fedyk and Sysa (1971) provided important information on chromosome structure and hybridization, while later investigations by Olech and collaborators focused on inbreeding, founder representation, MHC variability, and the long-term genetic management of the species (Olech 1987; 1999; 2006; 2009; Łopieńska *et al.* 2011; Burzyńska *et al.* 1999).

Beginning in the late twentieth century, SGGW research increasingly expanded toward practical conservation biology and restitution programs. Studies conducted by Olech, Perzanowski, and collaborators addressed reintroduction strategies, metapopulation management, ex situ conservation, and the establishment of new free-ranging herds in different regions of Poland (Olech & Perzanowski 2002, 2003; 2022; Perzanowski & Olech 2007; Olech *et al.* 2019; 2024; Trzeciak *et al.* 2005; Tracz *et al.* 2008; Kaczmarek-Okrój & Olech 2023). These investigations contributed directly to the development of national and international conservation strategies and emphasized the importance of coordinated population management for long-term species survival.

Studies conducted in the following years underline the importance of habitat continuity, landscape-scale management, and international cooperation in restoring viable populations within mountainous regions characterized by fragmented habitats and complex geopolitical conditions (Klich & Perzanowski 2012; Klich & Perzanowski 2013; Perzanowski & Olech 2013; Olech & Perzanowski 2016; Perzanowski *et al.* 2019; 2023). Population growth, distribution, and actual population density based on field monitoring and ecological data are also discussed. For example, a study by Wołoszyn-Gałęza *et al.* (2025) highlights that the Bieszczady population has increased significantly in recent decades, making it one of the most important free-ranging wisent

populations in Europe. The paper also examines challenges related to high local density, habitat pressure, and management of the species in mountainous forest ecosystems.

One of the key areas of research concerns the genetic structure and long-term viability of the species. Studies conducted by SGGW scientists have demonstrated that the level of inbreeding within the Pszczyna (PL) genetic subline remains an important challenge for conservation management, requiring continuous pedigree analysis and careful breeding strategies to maintain population fitness and genetic stability (Olech, 2025a).

Together, the research conducted at SGGW substantially contributed to transforming the European bison from a species surviving only in captivity into a successfully restored component of the European fauna. The integration of anatomical, physiological, veterinary, and conservation-oriented studies established SGGW as one of the major scientific centers involved in European bison research and conservation.

Environmental and anthropogenic factors

Environmental and anthropogenic factors play a crucial role in shaping the health, welfare, and conservation status of the European bison (Kośła *et al.* 2019; Thor *et al.* 2023). One of the major anthropogenic threats is the increasing contact between European bison and domestic cattle, which raises the risk of pathogen transmission, including infectious and parasitic diseases. Research conducted among cattle breeders demonstrated that shared grazing areas and the expansion of European bison populations intensify interactions between wild and domestic ungulates, increasing concerns about disease spread and economic losses (Klich *et al.* 2023). Human activities also influence European bison habitat use and behavior. Studies using airborne laser scanning data revealed that European bison show clear habitat preferences associated with forest structure, food availability, and landscape heterogeneity, indicating that environmental conditions strongly affect their spatial ecology and access to resources (Klich *et al.* 2023a).

Supplementary feeding practices constitute another important anthropogenic factor affecting forest ecosystems and European bison ecology. Research demonstrated that winter supplementary feeding can significantly alter soil seed banks and vegetation composition around feeding sites, promoting ruderal and nutrient-demanding plant species and influencing long-term habitat dynamics (Jaroszewicz *et al.* 2017). These findings indicate that management strategies intended to support European bison populations can simultaneously shape biodiversity patterns and ecosystem functioning.

Agricultural pressure is another important factor affecting European bison health. Crop depredation exposes animals to pesticides and plant protection products, which may accumulate in tissues and negatively affect physiological condition and long-term population health (Klich *et al.* 2020a). Human–wildlife conflicts associated with crop damage and the expansion of European bison populations were also identified as major social challenges in conservation management, especially in the Bieszczady Mountains, where local communities often perceive the species both as a conservation success and as a source of economic burden (Klich *et al.* 2018; 2021b).

At the same time, European bison can modify ecosystems through grazing. Studies on carabid beetle assemblages demonstrated that European bison grazing affects species composition and the functional diversity of insects, highlighting the ecological role of this large herbivore in shaping habitat structure and biodiversity (Schwerk *et al.* 2021). Additional studies showed that artificial waterholes created for European bison may function as biodiversity hotspots, attracting multiple animal species and increasing ecological heterogeneity within forest ecosystems (Thor *et al.* 2023).

Anthropogenic pressure also affects the welfare of captive herds. Elevated stress hormone levels were observed in captive European bison exposed to high visitor pressure and unfavorable herd social structure, suggesting that management practices and tourism-related disturbances can negatively affect animal welfare and physiological stress responses (Klich *et al.* 2021a). Another important aspect of SGGW activity involves the social and environmental dimensions of population management. Studies investigating public opinion revealed substantial differences between urban, rural, and urban–rural communities regarding acceptable European bison population sizes in Poland. These findings underline the importance of incorporating local stakeholder perspectives into conservation policies and conflict mitigation strategies (Kelly *et al.* 2025). In addition, SGGW scientists documented increasing mortality of European bison caused by collisions with vehicles and trains, identifying roads and railways as emerging threats associated with the expansion of free-ranging populations and habitat fragmentation. The authors emphasized the need for wildlife crossings, spatial planning, and targeted mitigation measures to reduce anthropogenic mortality (Klich *et al.* 2023b). Together, these studies demonstrate the central role of SGGW in integrating genetics, ecology, and social sciences into evidence-based management and conservation of European bison populations.

Conclusions and future perspectives

Over the last seven decades, research conducted at the Warsaw University of Life Sciences (SGGW) has contributed substantially to biological knowledge, veterinary management, and conservation of the European bison (*Bison bonasus*). Studies carried out by SGGW researchers have evolved from classical anatomical and physiological investigations to interdisciplinary research integrating genetics, veterinary medicine, ecology, and practical wildlife management. The results have been published in 363 papers (up to the year 2025), mainly in English (238). The most important journal was *Acta Theriologica*, which published 41 papers by researchers from SGGW.

The earliest investigations established important foundations for understanding the morphology and functional anatomy of the species. Detailed analyses of the skeletal, muscular, cardiovascular, and reproductive systems provided valuable comparative data for large ruminant biology and contributed directly to veterinary practice and breeding management. At the same time, studies on digestive physiology and nutrition expanded knowledge of ecological and physiological adaptations associated with herbivorous feeding and survival under captive and free-ranging conditions.

In subsequent decades, increasing attention was devoted to pathological changes, infectious diseases, and conservation genetics. Research on inbreeding, founder representation, and immunogenetic variability demonstrated the long-term biological consequences of the severe population bottleneck experienced by the species during restitution. At the same time, veterinary and parasitological investigations highlighted the growing importance of disease surveillance and health monitoring in expanding free-ranging populations.

More recent studies conducted at SGGW increasingly focused on practical conservation management, reintroduction programs, and long-term protection of genetically viable populations. Investigations of population structure, ex situ conservation, habitat management, and regional restitution programs contributed directly to the development of modern European bison conservation strategies in Poland and across Europe.

Together, these studies demonstrate the important role of SGGW in the development of European bison science and conservation. The integration of morphology, physiology, genetics, veterinary medicine, and wildlife management has created a broad scientific foundation supporting the successful restitution of the species.

Future research should increasingly focus on interdisciplinary approaches combining molecular genetics, disease ecology, population monitoring, and environmental sciences. Particular attention should be devoted to maintaining

genetic diversity, limiting pathogen transmission, improving connectivity among free-ranging populations, and understanding the ecological consequences of the continuing expansion of the species. The growing importance of One Health approaches and modern conservation medicine additionally highlights the necessity of integrating wildlife research with ecosystem and public health perspectives.

Despite numerous conservation challenges, the European bison remains one of the most successful examples of large mammal restitution in Europe (Krasińska & Krasiński, 2007). The long-term scientific contribution of SGGW has played an important role in this achievement and continues to support the future conservation and management of the species.

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Badania nad żubrem w Szkole Głównej Gospodarstwa Wiejskiego w Warszawie: 70 lat biologii i ochrony przyrody

Streszczenie: Żubr (*Bison bonasus*), największy ssak lądowy Europy, stał się znanym przykładem udanej restytucji gatunku poprzez hodowlę w niewoli i działania ochronne. Po wyginięciu na wolności na początku XX wieku, gatunek ten przetrwał jedynie w niewoli, a wszystkie współczesne populacje pochodzą od bardzo ograniczonej liczby założycieli. Działania restytucyjne zainicjowane w Polsce w latach dwudziestych XX wieku, szczególnie w Puszczy Białowieskiej, doprowadziły do udanej rekonstrukcji populacji wolno żyjących i ugruntowały pozycję Polski jako głównego ośrodka ochrony i hodowli żubra.

Gwałtowny rozwój programów ochrony stworzył potrzebę kompleksowej wiedzy biologicznej na temat tego gatunku. W związku z tym, od lat 50. XX wieku, w Polsce zainicjowano intensywne, multidyscyplinarne badania nad żubrem, w które zaangażowani byli naukowcy ze Szkoły Głównej Gospodarstwa Wiejskiego w Warszawie (SGGW), Polskiej Akademii Nauk i innych ośrodków badawczych. Badania te koncentrowały się na anatomii, morfologii, fizjologii, rozrodzie, patologii, genetyce i zarządzaniu dziką przyrodą, kładąc podwaliny pod współczesną biologię żubra. Znaczna część tych badań została opublikowana w serii „Bisioniana” w czasopiśmie „Acta Theriologica”, jednym z najważniejszych skoordynowanych programów naukowych poświęconych jednemu gatunkowi dużego ssaka w powojennej Europie.

Badania prowadzone w SGGW, często we współpracy z organizacjami naukowymi, parkami narodowymi, ośrodkami hodowlanymi i Lasami Państwowymi, w tym z Stowarzyszeniem Miłośników Żubrów, wniosły istotny wkład zarówno w naukowe zrozumienie, jak i praktyczną ochronę żubra. Badania naukowe prowadzone w SGGW zaowocowały ponad 360 pracami naukowymi

dotyczącymi żubra. Niniejszy przegląd przedstawia najważniejsze z tych publikacji i podsumowuje główne obszary badawcze rozwijane przez naukowców SGGW na przestrzeni lat. Recenzowane publikacje obejmują szeroki zakres tematów, w tym biologię ochrony przyrody, medycynę weterynaryjną, genetykę, ekologię, zarządzanie populacją oraz interakcje między człowiekiem a dzikimi zwierzętami. Razem ilustrują one znaczący wkład naukowców SGGW w biologiczne zrozumienie i ochronę żubra w ciągu ostatnich siedmiu dekad.
